

Installation manual for Kathrein RFID UHF-Antennas

Low Range Antennas
Mid Range Antennas
SM SH © KRAI Antennas
Wide Range Antennas
Wide Range © KRAI Antennas

This document is valid for all Kathrein RFID antennas and describes the construction and the installation of the antennas.

RFID-UHF-Antennas

This manual applies to the following RFID UHF types:

Type:

U-LoRa ETSI/FCC; Ultra Low Range antenna ETSI/FCC, 865-928 MHz

LoRa ETSI; Low Range-antenna ETSI, 865-870 MHz

LoRa FCC; Low Range-antenna FCC, 902-928 MHz

Order number:

52010092

52010084

52010085



Type:

MiRa ETSI; Mid Range antenna ETSI, 865-870 MHz, 100° circular

MiRa FCC; Mid Range antenna FCC, 902-928 MHz, 100° circular

S-MiRa ETSI/FCC; Short-Mid Range antenna ETSI/FCC, 865-928 MHz, 100° circular

Order number:

52010082

52010083

52010172

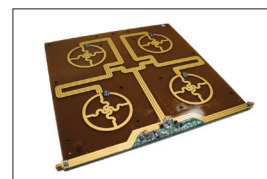


Type:

SMSH-30-30-KRAI-Slave ; SMSH © KRAI Antenna, 865-928 MHz

Order number:

52010197



Type:

WiRa 70° ETSI; Wide Range antenna ETSI, 865-870 MHz, 70° circular

WiRa 70° FCC; Wide Range antenna FCC, 902-928 MHz, 70° circular

WiRa-70-KRAI-ETSI; Wide Range © KRAI antenna ETSI, 865-868 MHz

WiRa-70-KRAI-FCC; Wide Range © KRAI antenna FCC, 902-928 MHz

Order number:

52010078

52010079

52010193

52010194



Type:

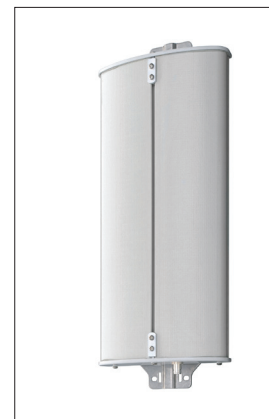
WiRa 30° ETSI; Wide Range-antenna ETSI, 865-870 MHz, 30° circular

WiRa 30° FCC; Wide Range-antenna FCC, 902-928 MHz, 30° circular

Bestellnummer:

52010086

52010087



**The information in this manual was correct at the time of editorial deadline.
We reserve the right however to make changes at any time and without prior notice.**

This document was prepared for specialist personal who install, configure and place in operation the reader.

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Scope

The information contained in this manual is intended for the support of the development process and as development guidance for the customer. In addition this manual offers supporting information about the standards to be applied at the place of installation and the relevant safety standards for installation and configuration of the Kathrein reader.

General information

This manual contains information on the installation, configuration, operation and maintenance of the reader. In addition it gives detailed technical data in order better to familiarise the user with the features of the reader.
In order to ensure a long working life and fault-free operation, this manual should therefore be read carefully and all the instructions and information contained in it should be complied with.

Warranty

Switching on the AC or DC power supply prior to connecting the LAN cable is considered incorrect installation. Any functional defect arising as a result is excluded from the warranty/guarantee. Before installing or servicing the reader, the person concerned must have read the manual and understood its contents. Kathrein accepts no liability if the customer fails to implement the precautions listed here. In such cases, any claims under the warranty/guarantee are void.

Disposal instruction



Electronic equipment is not classed as household waste and must be disposed of properly in accordance with Directive 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on used electrical and electronic equipment.
At the end of its service life, take this device for disposal at a designated public collection point.



Used batteries are special waste!

Do not put used batteries into your domestic waste; instead take them to a collection point for used batteries!

Abbreviations used in Application note:	
CK	Connecting Kit
DIN	Deutsches Institut für Normung (German Institut for Standardisation)
EIFF	Effective Isotropic Field Factor EIFF shows the field isolation from far-field to near-field in relation to the isotropic monopole
EIRP	Equivalent Isotropically Radiated Power
EN	Europäische Norm (European standard)
ERP	Effective Radiated Power
LoRa	Low Range
MiRa	Mid Range
PoE	Power over Ethernet
RFID	Radio Frequency Identification
SAR	Specific absorption rate
SMSH	SMSH © KRAI planar antenna module
S-MiRa	Short Mid Range
UHF	Ultra High Frequency
U-LoRa	Ultra Low Range
WiRa	Wide Range

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Key

**Caution**

Indicates a potentially dangerous situation which, if disregarded, can lead to injuries ranging from minor to severe and/or damage to the unit.

Note

Information intended to make a specific topic easier to understand and/or enable optimal use of the unit functions.

General safety notes

**Important!**

Before starting installation work or replacing the unit, the accompanying manual must be read carefully and its contents understood.

The detailed information in the data sheets and in this manual must be complied with carefully during installation and operation of the reader!

The installation team must be properly qualified and familiar with the safety regulations applicable in the country concerned.

Connection, installation and maintenance work, as well as all other work on the unit, may only be carried out by properly qualified and trained employees.

The unit may only be used for the purpose intended by the manufacturer.

Unauthorized changes to the unit and the use of spare parts and peripheral devices which are not sold or recommended by the manufacturer can result in fires, electric shocks and injuries. Such actions therefore result in exclusion of liability and make the manufacturer's warranty/guarantee null and void.

The applicable version of the manufacturer's warranty is that which was valid at the time of purchase. We accept no liability for unsuitable manual or automatic adjustments made to the unit's parameters and inappropriate use of the unit.

Repairs may only be undertaken by personnel authorised to perform them. Opening or attempting to repair the unit makes all guarantee/warranty claims null and void! Improper work on the unit may jeopardise electrical safety.

The manufacturer is not liable for accidents caused by the user opening the unit!

When carrying out work on the unit, the valid safety regulations must be complied with.

Supply voltage

**Important!**

Make sure that the mains cable (power supply cable) is not damaged. If the mains cable is damaged, the device must not be used. Instead it must be disconnected from the mains and repaired by a qualified technician. Use only the power supply unit supplied!

Risk of fatal injury due to electric shock!

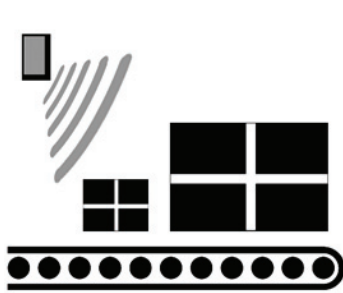
The device may be operated only at the stated supply voltage (see the rear of the device or external power supply unit)!

If the supply voltage is too high, there is a risk of fire!

2.1. RFID UHF antenna

The new Kathrein antenna family consists of various UHF reader antennas, which can meet the needs of virtually any RFID application.

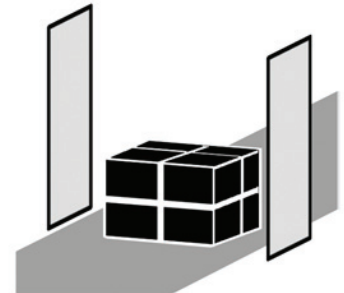
The antennas are divided into three product lines with respect to the reading range: low range, mid range and wide range antennas.



Low Range



Mid Range



Wide Range



- | | |
|--------------|---------------------------|
| 0 to 10 cm | - with Low Range antenna |
| 20 cm to 2 m | - with Mid Range antenna |
| 1 m to 10 m | - with Wide Range antenna |

This allows to up 4 antennas are used simultaneously in any combination with Kathrein RFID reader. This modularity is only possible with Kathrein RFID readers and antennas.

2.2. Scope of supply

The package content includes the following:

- 1 antenna
- associated technical data sheets

In the delivery of antennas is included no cable. These must be ordered separately.

2.3. Accessories

The following accessories are available for the reader (if you have questions about the accessories, please contact our Sales Office):

- Antennas: For use with UHF-RFID antennas; we recommend the Kathrein RFID antenna types ULoRa, LoRa, MiRa, WiRa. These antenna types are available for all frequency ranges. The mentioned types of antennas are available for all frequency ranges and in protection class IP 65.

- **Antenna cable**

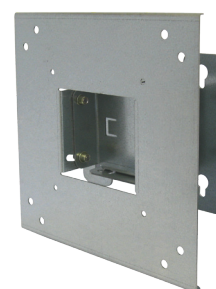
Order number	Type	Connector 1	Connector 2	Length (cm)
52010174	R-AC 3 TNC-TNCR	TNC	TNC Reverse	LL240 flex, 300
52010175	R-AC 6 TNC-TNCR			LL240 flex, 600
52010176	R-AC 10 TNC-TNCR			LL240 flex, 1000
52010177	R-AC 15 TNC-TNCR			LL240 flex, 1500
52010178	R-AA TNC-N(f-m)	TNC (socket)	N-Socket	
52010090	R-AC 3 SMA-TNCR	SMA (socket)	TNC (socket)	RG 58, 300
52010208	R-AC 05 SMA-SMA	SMA (socket)	SMA (socket)	RG 58, 50

- **Cable sets (without antenna cable)**

Order number	Type	Product type
For use only RRU and ARU Reader:		
52010125	CK-RRU RS4	Power supply cable M12/open, length 1.5 m, RS 422/485 interface cable M12/open, length 1.5 m, 2 x GPIO cable M12/open, length 1.5 m
52010126	CK-RRU ETG	Power supply cable M12/open, length 1.5 m, Ethernet interface cable M12/RJ 45 socket, length 1.5 m, 2 x GPIO-Kabel M12/open, length 1.5 m
For use only M-ARU Reader:		
52010189	CK-M-ARU RS	Combination cable for power supply GPIOs and RS232 interface, M12/open, length 1.5 m
52010209	CK-M-ARU PoE	Combination cable for power supply and PoE interface, M12/RJ 45, length 1.5 m

- **Mounting Accessories**

Order number	Type	Product type
52010005	MK-WiRa30	Wall mount/mast mounting set for 30° WiRa antennas
52010128	MK-ARU WiRa70	Wall mount/mast mounting set for RFID antennas and RRU4/ARU4-readers (to 6.0 kg total weight).



- **Readers power supply**

Order number	Type	Product type
52010179	R-RPA 115-230V/24V	RRU / ARU 230V power supply with safety plug (Lörrar); 24V DC power supply with M12 socket 4-pin, A-coded
52010192	R-ERPA 115-230V/24V	ERU 230V power supply 24V DC cable plug connector 2.5 mm

- **Protective Covers**

Order number	Type	Product type
52010127	Protective covers set for the RRU and ARU reader series	Accessories for RRU4/ARU4 reader with screw caps for 3x antenna input (R-TNC) and 2x digital (M12)

3.1. Low range antennas

The low range antennas are a highlight of the new antenna series. With dimensions of 90 x 63 mm, these antennas have a high field concentration in the near-field, with significantly reduced antenna gain in the far-field. With these properties, the antennas achieve outstanding writing/reading performance at ranges of up to 10 cm with a typical selectivity of 5 cm. Low range antennas are available in LoRa (Low Range) and ULoRa (Ultra Low Range). The ULoRa was designed to read dipole-shaped tags ("far-field tags") at an extremely limited distance. These antennas can also read loopshaped tags ("near-field tags") up to 3 cm. The LoRa was developed for larger ranges and is particularly suited to near-field tags.



Figure 1: Low range antenna



Figure 2: Ultra-Low range antenna

3.2. Mid range antennas

The MiRa 100° was developed for applications in the area between near-field and far-field. Particular importance was placed on creating a compact construction to enable integration into environments with limited space. Read ranges of over 2 m are still possible even with dimensions of 156 x 126 mm. MiRa also offers increased selectivity at lower reading distances compared with conventional antennas. This antenna design is therefore also suitable for use in the so-called transition area with a variety of transponder types



Figure 3: Short-Mid range antenna



Figure 4: Mid range antenna

For short range to offer the S-MiRa antenna that is optimized with the same basic Parameter for angle and transmission level as our standard mid range antenna, small reading range to 1.0 m.

3.3. Smart Shelf antenna

The SSMH 30-30-KRAI slave antenna was developed for applications in the field of point of sale, smart shelf applications and Kanban solutions. The antenna is characterized by an extremely homogeneous read zone, which is emitted by the high front to back ratio. Therefore it is suitable for static detection of multiple transponders. Due to their extremely thin design, the antenna module can be integrated into different applications universal.

The antenna is equipped with an intelligent bypass circuit that allows for cascading up to 8 SSMH modules per reader port. The control is done by a suitable © KRAI Kathrein RFID reader, the © KRAI control signals are transmitted via the standard antenna cable

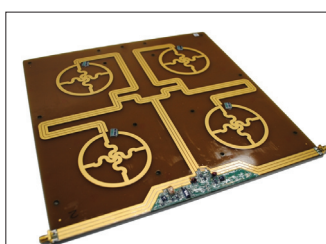


Figure 5: SSMH © KRAI antenna

3.4. Wide range antennas

For traditional wide-range applications with read ranges of up to 10 m, Kathrein offers the two new wide range antenna types characterised by half power beam widths of 70° (WiRa 70°) and 30° (WiRa 30°). The circular polarisation usually required for UHF applications has been significantly improved compared with other antennas available on the market. For the so-called axial ratio, which is used as a characteristic value for circular polarisation, the two new models achieve typical values of 1 dB. If specified at all, the usual value on the market lies at around 3 dB.

The improved circularity leads to a significant reduction in the dependence of the reading results on the position or alignment of the transponder. Great importance was also placed on the front-to-back ratio of the antennas to reduce the influence of the adjacent (installation) environment on the antenna properties.

All antennas have an extremely high protection class which guarantees problem-free use in any environment.

The use of high-quality materials for a long service life and high levels of reliability contribute to the optimal performance provided by the antennas under even the most challenging of conditions.



Figure 6: Wide range 70° antenna



Figure 7: Wide range 30° antenna

3.5. Wide range © KRAI antennas

By © KRAI (Kathrein RFID Antenna Interface), electrical properties of the antenna can be changed and adapted through the standard coaxial cable with a Kathrein KRAI Reader.

The WiRa 70-KRAI-FCC can be switched dynamically or statically between these polarizations:

- Circular LHCP / Circular RHCP
- Linear horizontal / Linear vertical



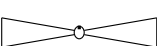
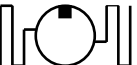
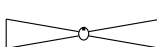
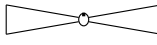


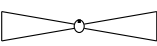

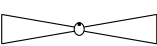
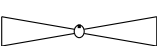


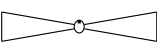

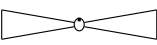

4 LEDs for visualization are available for programming

The configuration is done via the Kathrein Reader Start V2.xx.



Figure 8: Wide Range © KRAI 70° antenna

3.6. Antenna type according to read range and transponder shape

Antenna type	Read range	Tag type		
		Loop-shaped	Hybrid	Dipole-form
LoRa ULoRa	0-10 cm			
SMiRa	0-10 cm			
	10-100cm			
MiRa	10-30 cm			
	30-100 cm			
	> 100 cm			
WiRa 70° WiRa 30°	10-30 cm			
	30-200 cm			
	> 200 cm			

The correct combination of reader antenna and transponder is essential for every RFID application. The correct selection ensures a high read rate and reliable operation of the system.

The LoRa and ULoRa antennas can read loop-shaped, hybrid-form and dipole-form transponders up to 10 cm and offer a very well defined read range.

MiRa can read loop-shaped transponders up to 30 cm, hybrid-form transponders up to 100 cm and dipole-form transponders up to several metres.

The WiRa antennas are designed for typical dipole-form transponders with read ranges of up to 10 m, but they can also read loop-shaped and hybrid-form transponders at a short distance.

The typical read ranges of the antennas described can be seen in the following figure. If WiRa 30° and WiRa 70° are operated with the same ERP, the maximum ranges of the two antennas are equal, although the WiRa 30° has a higher selectivity.

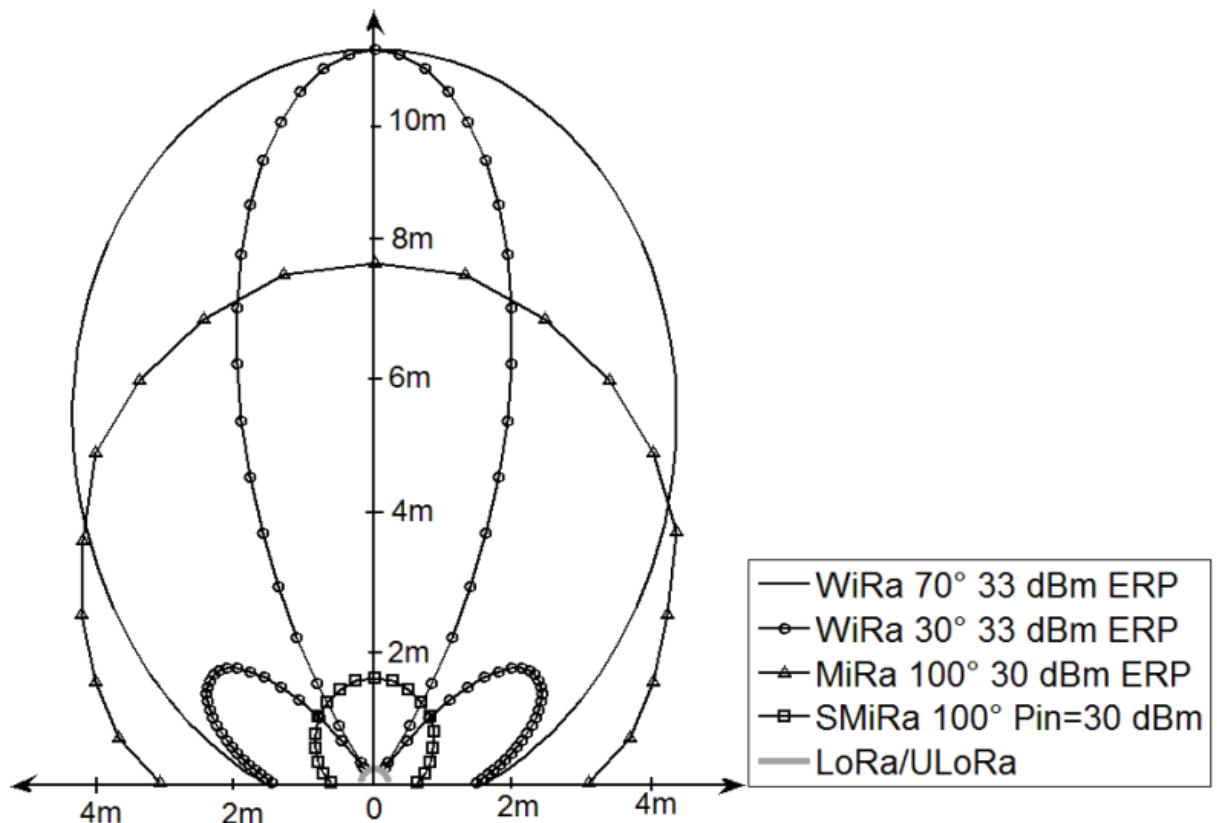


Figure 9: Read ranges of LoRa/ULoRa, SMiRa, MiRa, WiRa 70° and WiRa 30°

Note

To achieve the best reading and writing results, we recommend operating the Kathrein UHF RFID reader antennas exclusively with UHF readers from Kathrein.

As a further option, it is possible to integrate the modular Kathrein RFID UHF reader platform in the WIRA antennas to also provide a powerful single read point for certain applications. As a result of the consistent continuation of the platform strategy for antenna and reader, all product and interface variants already introduced are available in numerous combinations. Cost-efficient adaptation to varying customer requirements is therefore possible as a result. For all variants protection class IP 67 and an operating temperature range from -20 to +55 °C apply. A TNC socket is used as the antenna interface on all types.

3.7. Maximum range

Note

For maximum range there must not be any interfering objects between the antenna and the tag to be read.

4.1. Ultra-Low range and Low range antennas

Type		U-LoRa (ETSI/FCC)	LoRa (ETSI)	LoRa (FCC)
Order number		52010092	52010084	52010085
Frequency range	MHz	865-928	865-868	902-928
Antenna gain	dBi	-30	-15	-15
EIFF ^{*)}	dB	15	20	20
VSWR		<1.2:1	<1.3:1	<1.8:1
Impedance	Ω	50	50	50
Range of near field tags ^{**)}	cm	3	7	7
Selectivity of near field tags ^{**)}	cm	3	5	5
Range of far field tags ^{**)}	cm	8	-	-
Selectivity of far field tags ^{**)}	cm	10	-	-
Max. input power ^{***)}	W	1	0.5	0.5
Connection		TNC socket	TNC socket	TNC socket
Protection class		IP 67	IP 67	IP 67
Weight	g	110	110	110
Dimensions (W x H x D)	mm	90 x 63 x 31	90 x 63 x 31	90 x 63 x 31
Packing dimensions (approx.)	mm	250 x 165 x 50	250 x 165 x 50	250 x 165 x 50
Material	Tough, weather-resistant polymer blend; Colour: RAL7045			
Installation	Four through-holes Ø 4.2 mm for M4 screws			
Temperature range	Storage temperature: -40° C - +85° C Ambient temperature: -20° C - +55° C			

^{*)} The Effective Isotropic Field Factor (EIFF) shows the field isolation from far field to near field standardised to an isotropic radiator. The values were determined with 3 cm spacing

^{**)} dependant upon transmission power and tag type

^{***)} compliant to FCC


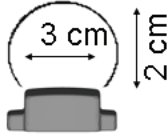
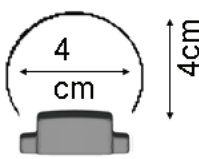

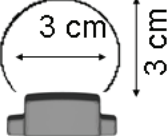
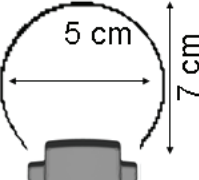
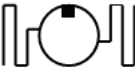
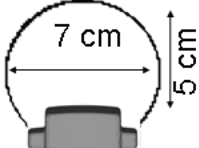

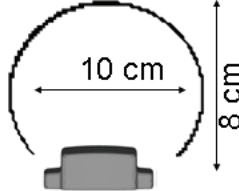
Tag types	Ultra Low range antenna	Low range antenna
 Loop-shaped (near field tags)		
		
 Hybrid		-
 Dipole-form (far field tags)		-

Figure 10: Read ranges of LoRa and U-LoRa by tag antenna

LoRa antennas are only suitable for loop-shaped tags.
 There is no defined reading zone with hybrid tags and dipole-form tags.

4.2. Short-Mid range antenna

Type		S-MiRa (ETSI/FCC)
Order number		52010172
Frequency range	MHz	865-928
Polarization		circular
Antenna gain	dBic	-12 @ 866 MHz -10 @ 915 MHz
Axial ratio	dB	typ. 2
VSWR		< 1.4:1
Impedance	Ω	50
Front-to-back ratio	dB	> 8 (depending upon installation situation)
Max. input power (FCC15.247 / ETSI EN 302 208)	W	1.0
Far field half power beam width	°	100° half power beam width
Connection		TNC socket
Protection class	IP	67
Weight	g	320
Dimensions (W x H x D)	mm	154 x 126 x 36
Packing dimensions (approx.)	mm	230 x 160 x 81
Material	Housing: Tough, weather-resistant polymer blend; colour: RAL7045	
Installation	Four through-holes Ø 4.2 mm for M4 screws	
Temperature range	Storage temperature: -40° C - +85° C Ambient temperature: -20° C - +55° C	

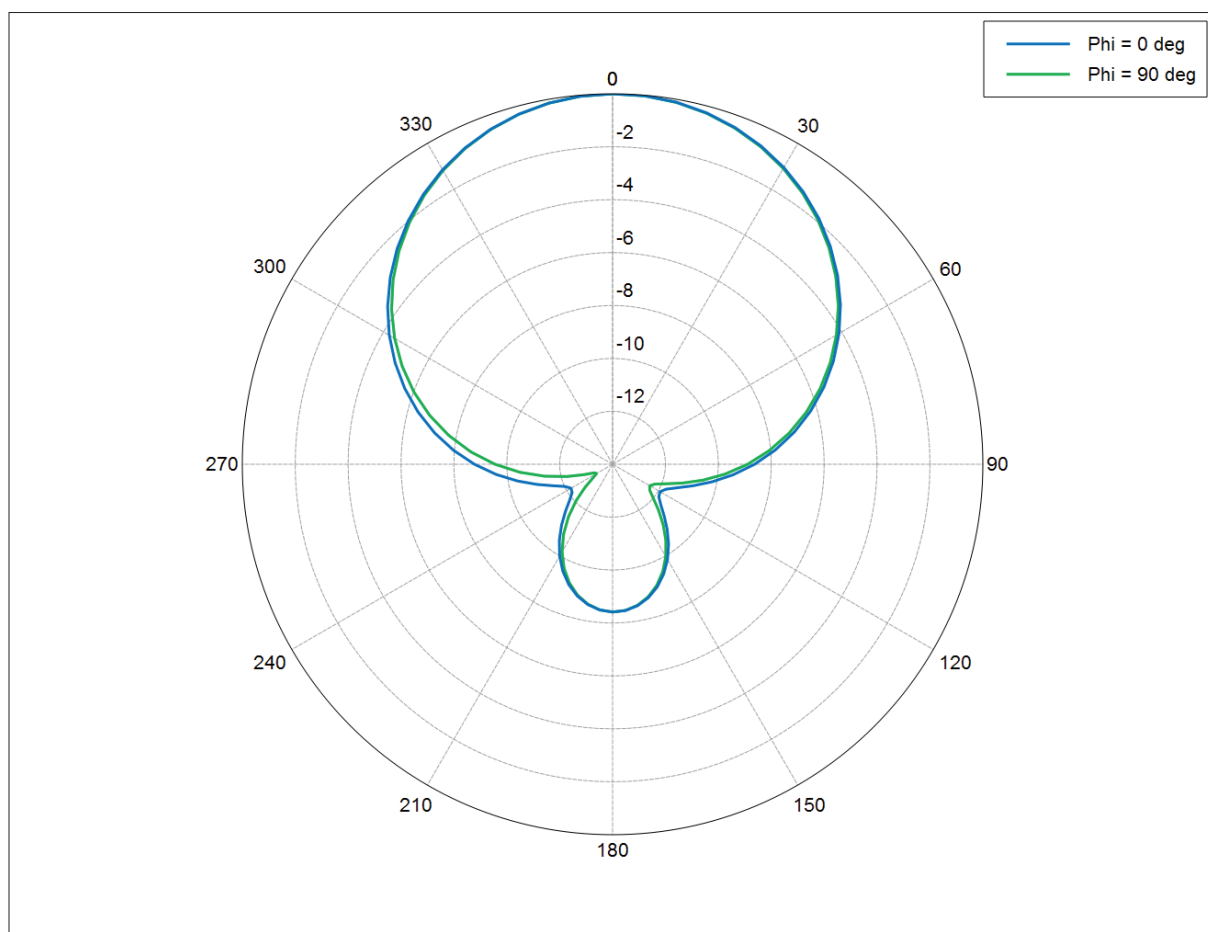


Figure 11: Antenna directivity S-MiRa

The antenna directivity shows the propagation characteristics of the EM field of the antenna. The half power beam width and the front to back ratio can be read from it.

4.3. Mid range antennas

Type		MiRa (ETSI)	MiRa (FCC)
Order number		52010082	52010083
Frequency range	MHz	865-868	902-928 MHz
Polarization		circular	circular
Antenna gain	dBic	2.5	2.5
Axial ratio	dB	typ. 1.5	typ. 2.5
VSWR		< 1.3:1	< 1.5:1
Impedance	Ω	50	
Front-to-back ratio - circular	dB	> 10 (depending upon installation situation)	> 10 (depending upon installation situation)
Max. radiated power (ETSI EN 302 208)	W	1.0 ERP	-
Max. input power (FCC 15.247)	W	-	1.0
Far field half power beam width	°	100° half power beam width	100° half power beam width
Connection		TNC socket	TNC socket
Protection class	IP	67	67
Weight	g	320	320
Dimensions (W x H x D)	mm	154 x 126 x 36	156 x 126 x 36
Packing dimensions (approx.)	mm	230 x 160 x 81	230 x 160 x 81
Material	Housing: Tough, weather-resistant polymer blend; colour: RAL7045		
Installation	Four through-holes Ø 4.2 mm for M4 screws		
Temperature range	Storage temperature: -40° C - +85° C Ambient temperature: -20° C - +55° C		

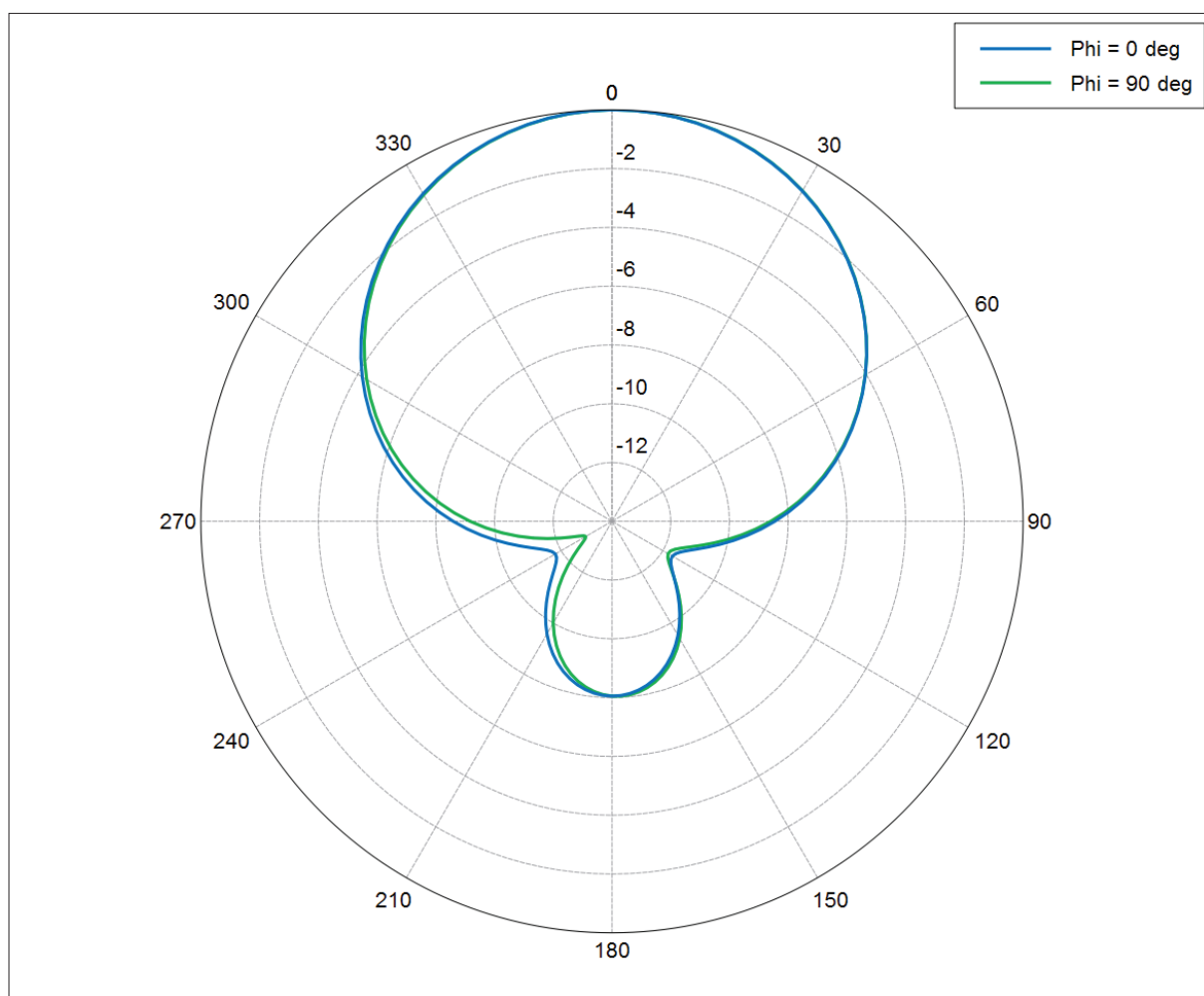


Figure 12: Antenna diagram MiRa

The antenna directivity shows the propagation characteristics of the EM field of the antenna. The half power beam width and the front to your ratio can be read from it.

4.4. SSMH © KRAI planar antenna module

Type		SSMH-30-30 KRAI-Slave
Order number		52010197
Frequency range	MHz	865-928
Polarization		circular
Antenna gain	dBic	typ. -7
Axial ratio	dB	typ. 1.5
VSWR		< 1.25:1
Impedance	Ω	50
Front-to-back ratio - circular	dB	> 20
Max. radiated power (ETSI EN 302 208)	W	2
Max. input power (FCC 15.247)	W	1
Far field half power beam width	°	60°60°
Connection	input output	SMA socket SMA socket
Protection class	IP	indoor
Weight	g	0.5
Dimensions (W x H x D)	mm	319 x 300 x 8.6
Packing dimensions (approx.)	mm	330 x 310 x 25
Material	fiberglass-epoxy resin; copper, gold	
Installation	10 through-holes \varnothing 4,5 mm for M4 screws	
Temperature range	Storage temperature: -40° C - +85° C Ambient temperature: -20° C - +55° C	

4.5. Wide range 70° antennas

Type		WiRa 70° (ETSI)	WiRa 70° (FCC)
Order number		52010078	52010079
Frequency range	MHz	865-868	902-928
Polarization		right-Hand circular (RHC)	
Antenna gain	dBic	8.5 @ 866 MHz	8.3 @ 915 MHz
Axial ratio	dB	typ. 1	
VSWR		< 1.2:1	
Impedance	Ω	50	
Front-to-back ratio	dB	> 18	
Max. radiated power	W	2.0 ERP (ETSI EN 302 208)	4.0 EIRP (FCC 15.247)
Far field half-power beam width	°	69°/69°	
Connection		TNC-socket	
Protection class		IP 65	
Weight	kg	~1.7	
Dimensions (W x H x D)	mm	270 x 270 x 45	
Packing dimensions (approx.)	mm	300 x 300 x 150	
Material		Tough, weather-resistant polymer blend	
Installation		Four M5 drill holes 100 x 100 mm	
Temperature range		Storage temperature: -40° C - +85° C Ambient temperature: -20° C - +55° C	

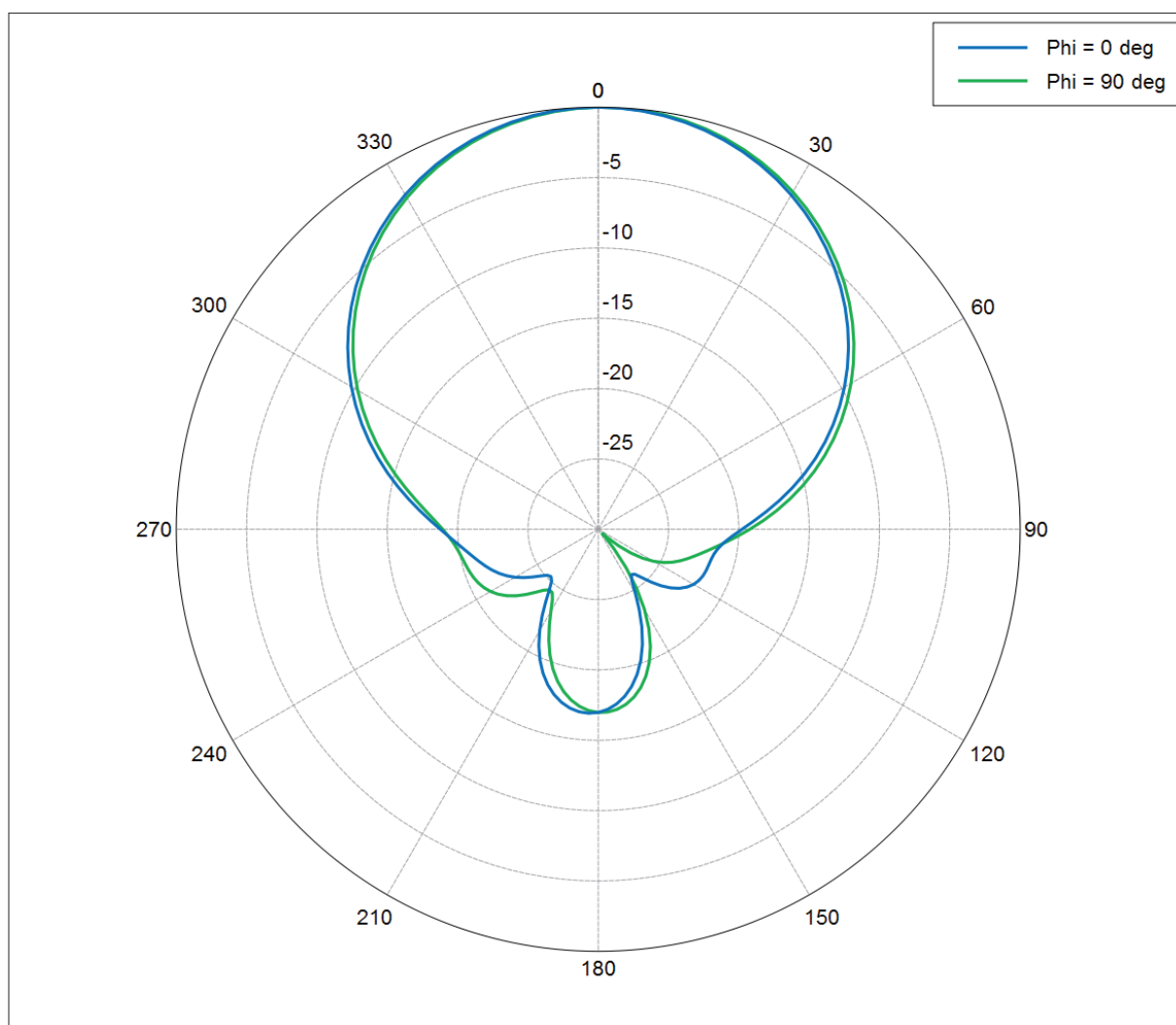


Figure 13: Antenna diagram WiRa 70° ETSI/FCC

The antenna points to the propagation characteristics of the EM field of the antenna. It would therefore appear the opening angle and the front-back ratio.

4.6. Wide range © KRAI 70° antennas

Type		WiRa-70°-KRAI (ETSI)	WiRa-70°-KRAI (FCC)
Order number		52010193	52010194
Frequency range	MHz	865-868	902-928
Polarization circular		LHCP / RHCP *	
- Antenna gain	dBiC	typ. 6,5	
- Axial ratio	dB	typ. 2	
Polarization linear		Horizontal / Vertical	
- gain	dBiC	typ. 7.5	
- VSWR		< 1.2:1	
Impedance	Ω	50	
Front-to-back ratio	dB	> 18	
Max. radiated power		2.0 ERP (ETSI EN 302 208)	4.0 EIRP (FCC 15.247)
Far field half-power beam width	°	69°/69°	
Connection		TNC-socket	
Protection class		IP 65	
Weight	kg	~1.7	
Dimensions (W x H x D)	mm	270 x 270 x 45	
Packing dimensions (approx.)	mm	300 x 300 x 150	
Material		Polymer blend; Aluminium	
Installation		Four M5 drill holes 100 x 100 mm	
Temperature range		Storage temperature: -40° C - +85° C Ambient temperature: -20° C - +55° C	

* (Circular LHCP / Circular RHCP / Linear horizontal / Linear vertical)

Note

The antenna can be operated only in conjunction with a © KRAI Reader. When commissioning the antenna is circular! RHC polarized.

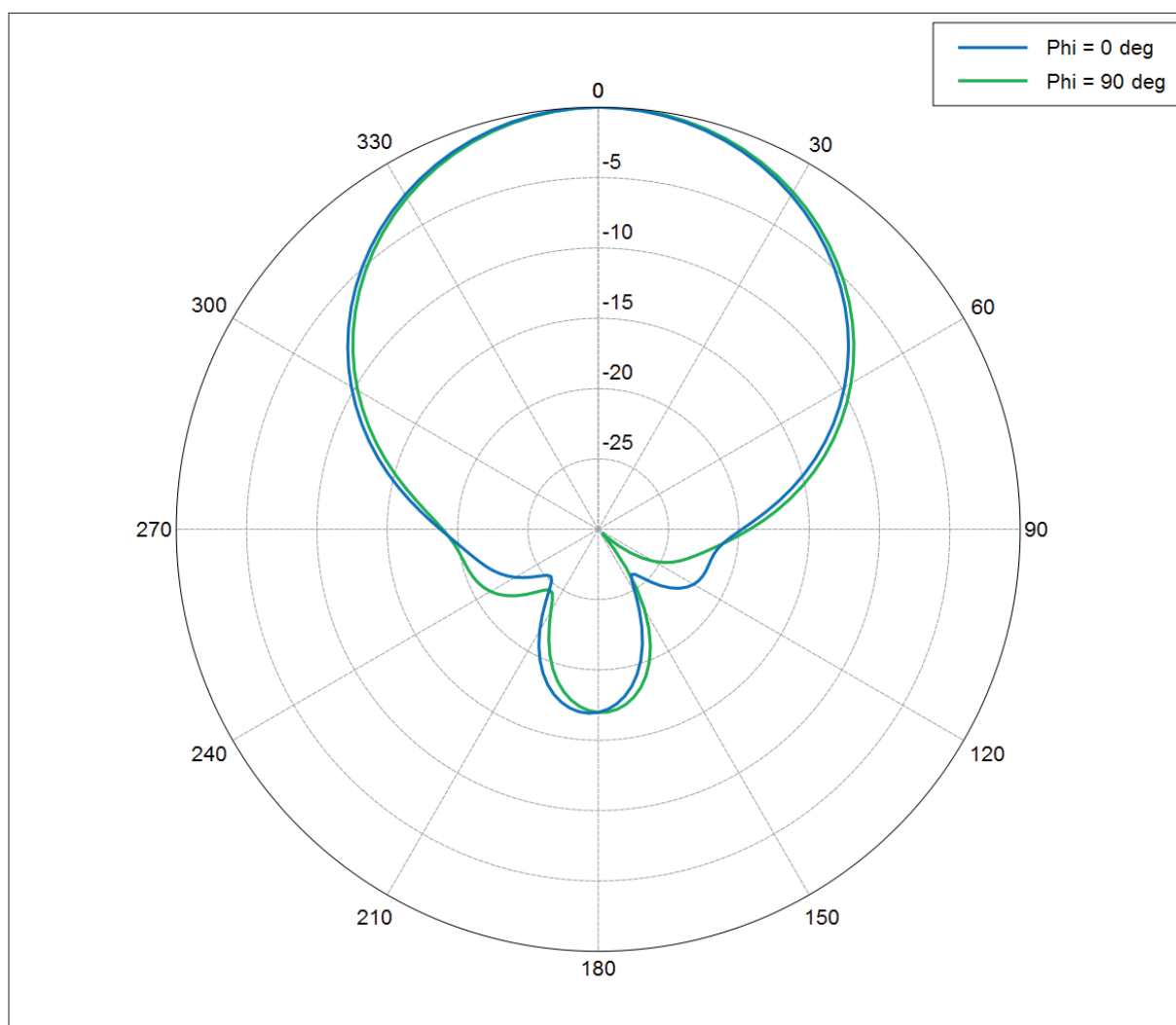


Figure 14: Antenna diagram WiRa-70°-KRAI ETSI/FCC

4.7. Wide Range 30° antennas

Type		WiRa 30° (ETSI)	WiRa 30° (FCC)
Order number		52010086	52010087
Frequency range	MHz	865-868	902-928
Antenna gain	dBic	11	10,5
Impedance	Ω	50	
VSWR		< 1,2:1	
Axial ratio	dB	< 2	
Polarization		right-handed circular (RHC)	
Front-to-back ratio	dB	> 20	
Max. radiated power (ETSI EN 302 208)	W	2,0 ERP (ETSI EN 302 208)	-
Max. radiated power (FCC 15.247)	W	-	1 W (30 dBm) conducted
Far field half-power beam width	°	30°/69°	30°/69°
Connection		N socket	N socket
Protection class		IP 65	IP 65
Weight	kg	~3,7	~3,7
Dimensions (W x H x D)	mm	557 x 262 x 59	
Packing dimensions (approx.)	mm	762 x 356 x 203	
Material		Polymer Blend, Aluminium	
Installation		The mounting kit 52010005 is available	
Temperatur range		Storage temperature: -40° C - +85° C Ambient temperature: -20° C - +85° C	

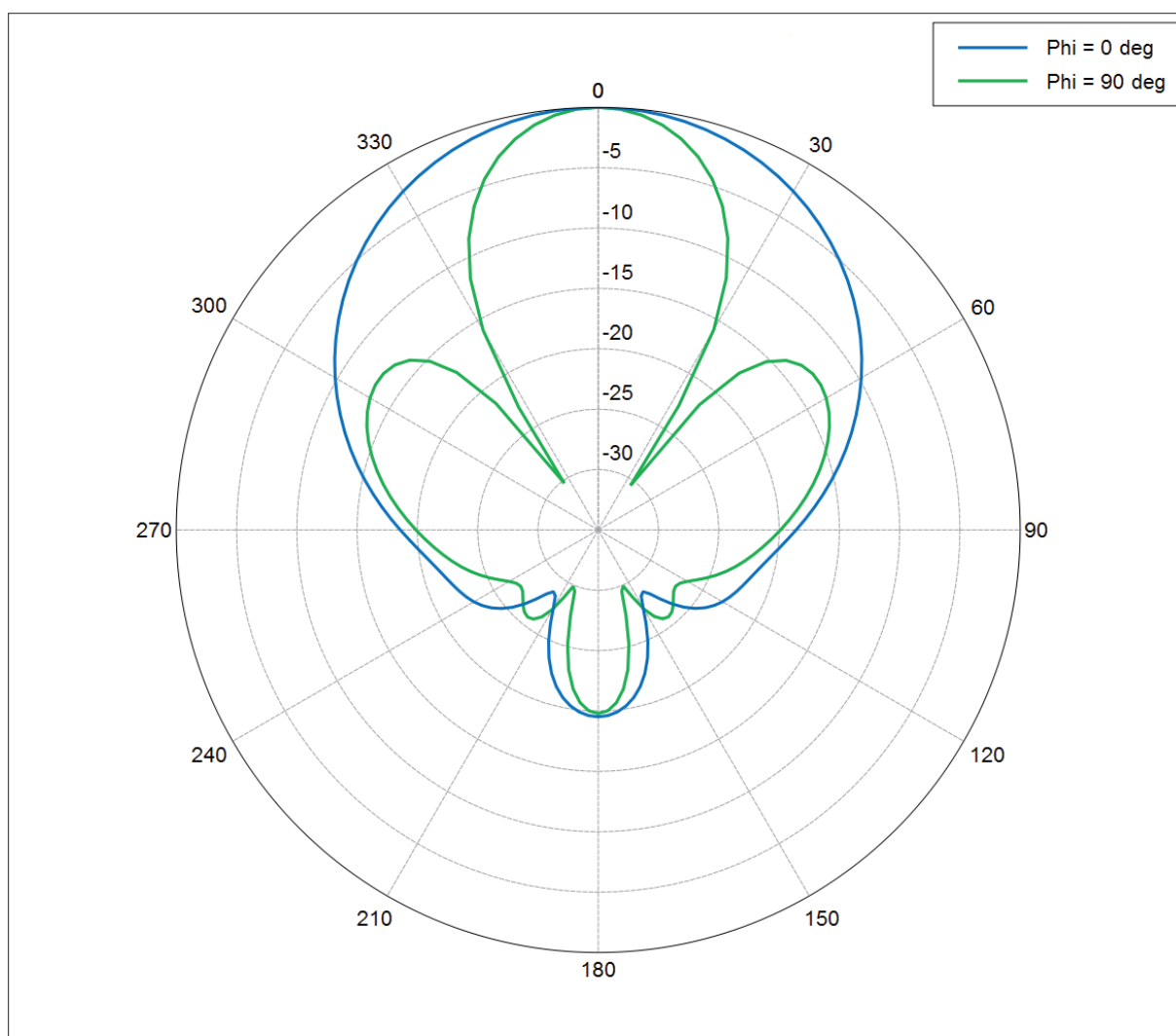


Figure 15: Antenna diagram WiRa 30° ETSI/FCC

The antenna points to the propagation characteristics of the EM field of the antenna. It would therefore appear the opening angle and the front-back ratio.

The MiRa and WiRa antennas are relatively insensitive to the type of attachment and the materials surrounding the antennas. Nevertheless few conductive objects in the vicinity of the antenna should be presented. In addition, other objects, such as containers with liquids in the vicinity of the antenna affect their functionality. In such cases, a reassessment of the antenna in the particular installation conditions is necessary. The LoRa antennas are very robust and suitable for installation in metallic environment.

5.1. Connecting kit for antennas and readers

Order number	Type antenna	Order number Connecting Kit	Type Conneting Kit
52010093	RRU4-RS4-E6	52010125	CK-RRU RS4
52010096	RRU4-RS4-U6		
52010099	ARU4-RS4-E6		
52010102	ARU4-RS4-U6		
Order number	Type reader	Order number Connecting Kit	Type Conneting Kit
52010094	RRU4-ETG-E6	52010126	CK-RRU ETG
52010095	RRU4-ETL-E6		
52010097	RRU4-ETG-U6		
52010098	RRU4-ETL-U6		
52010100	ARU4-ETG-E6		
52010101	ARU4-ETL-E6		
52010103	ARU4-ETG-U6		
52010104	ARU4-ETL-U6		
52010135	M-ARU RS232	52010189	CK-M-ARU RS
52010136	M-ARU RS232 FCC	52010189	CK-M-ARU RS
52010198	M-ARU-ETH-E4	52010209	CK-M-ARU PoE
52010199	M-ARU-ETH-U4	52010209	CK-M-ARU PoE

5.2. Cable laying

- The cable should be laid vertical (see Figure 13) away from the antenna and should be laid direct. The cable length is to be selected as short as possible to minimise cable losses.
- Cable loops around the antenna, as shown in Figure 12, or laying the cable in front of the antenna are to be avoided.



Figure 16: Do not lay cable in front of the antenna



Figure 17: Do not lay cable around the antenna!

5.3. Wall/mast clamp

Note

Selecting the installation location:

Before drilling the holes, make sure there are no electrical cables in the wall.

Risk if fatal injury due to electric shock !

Make sure that the wall / the mast has a sufficient capacity. Use the appropriate mounting hardware (not included). You may need to strengthen the wall of your desired mounting location or use a different masts.

5.3.1. Wall/mast clamp for RRU4/ARU4 Reader und RFID antennas

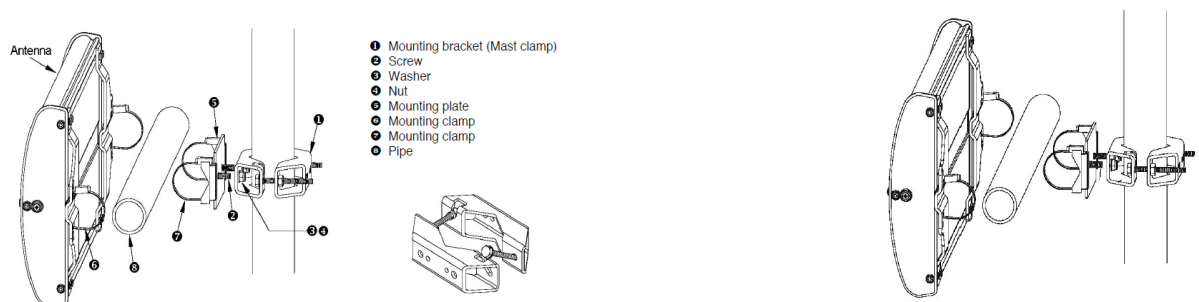
Wall/mast clamp for install RFID antennas and RRU4/ARU4 readers (up to 6.0 kg total weight). Mounting plate with various pre-drilled holes suitable for Wide range antennas ect.

Order number:		52010128
Max. load-bearing capacity	kg	6,0
Adjustment range	°	± 30 ± 30
Weight (unpacked)	kg	ca. 0,9
Dimensions of the clamp	mm	200 x 200 x 125
Dimension of the packing	mm	265 x 235 x 105
Material	Clamp: galvanised sheet stell Screw/hose clip: stainless steel	
Items supplied	Wall plate, mounting plate, mast clamp, hose clip, 8 screws M5x10, 8 shims, 4 screws M6*10	



5.3.2. Mast clamp for Wide range 30° antennas

Mast clamp for install Wide range 30° antennas to 2 - 4.5 inch (50 - 115 mm) mounting structures. Mounting plate with various pre-drilled holes suitable for Wide range antennas ect.



Order number:		52010005
Max. load-bearing capacity	kg	
Adjustment range	°	± 90
Weight (unpacked)	kg	1.5
Dimension of the packing	mm	200 x 150 x 75
Material	Stainless steel and galvanized steel; fasteners are stainless steel	
Items supplied	mounting bracket, 2x Sechskantschrauben M8x20, 2x Unterlegscheiben 8mm, 2x Senkkanmutter M8, mounting plate, 2-Clamp Kit	

5.4. Assignment Wall/mast clamp to antennas and readers

Order number antenna	Type antenna	Order nubmer Wall/mast clamp	Consisting of
52010086	WiRa 30° ETSI	52010005	Mast clamp AMB-10 for antennas 52010086 / 52010087
52010087	WiRa 30° FCC	52010005	Mast clamp AMB-10 for antennas 52010086 / 52010088
52010078	WiRa 70° ETSI	52010128	Wall/mast clamp (for antennas 52010078-83, -172, and readers 52010093-181)
52010079	WiRa 70° FCC		
52010082	MiRa ETSI		
52010083	MiRa FCC		
52010172	S-MiRa ETSI/FCC		
52010193	WiRa-70°-KRAI ETSI		
52010194	WiRa-70°-KRAI FCC		
Order number reader	Type reader	Order nubmer Wall/mast clamp	Consisting of
52010094	RRU4-ETG-E6	52010128	Wall mount/mast mounting set (for antennas 52010078-83, -172, and readers 52010093-135)
52010095	RRU4-ETL-E6		
52010097	RRU4-ETG-U6		
52010099	ARU4-RS4-E6		
52010100	ARU4-ETG-E6		
52010101	ARU4-ETL-E6		
52010102	ARU4-RS4-U6		
52010103	ARU4-ETG-U6		
52010104	ARU4-ETL-U6		
52010180	RRU4-ELC-E6		
52010181	RRU4-ELC-U6		

5.5. Installation drawings

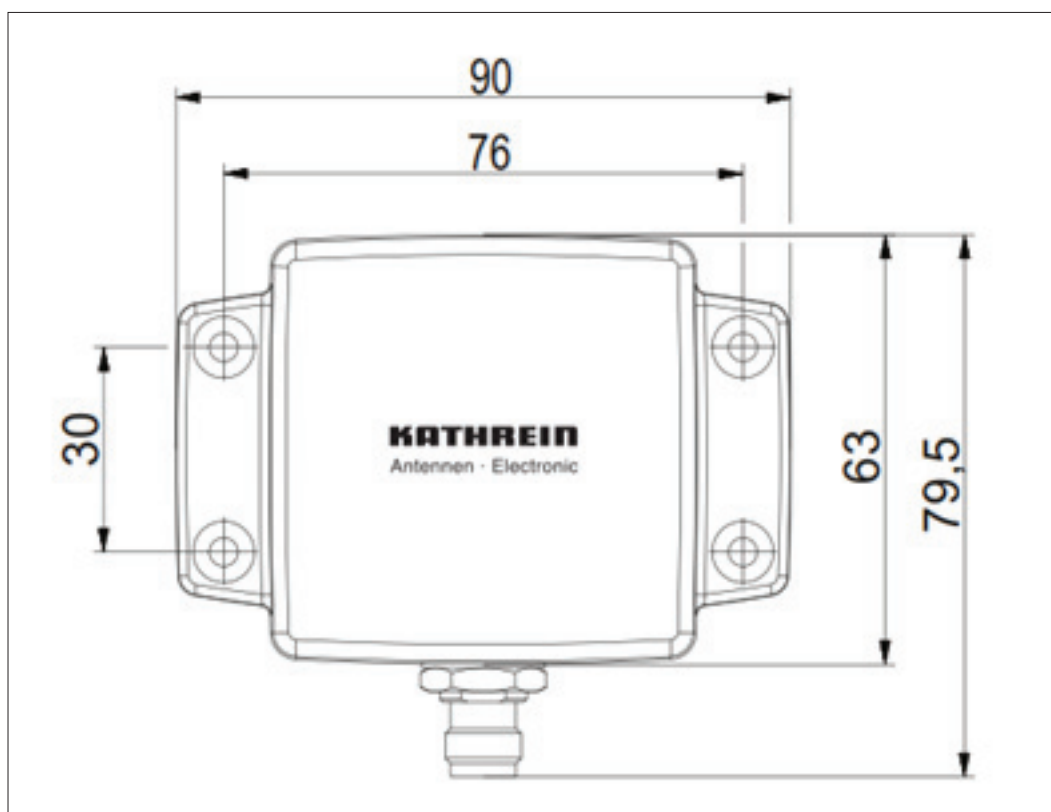


Figure 18: Dimensios for U-LoRa/LoRa antenna (52010092, -84, -85)

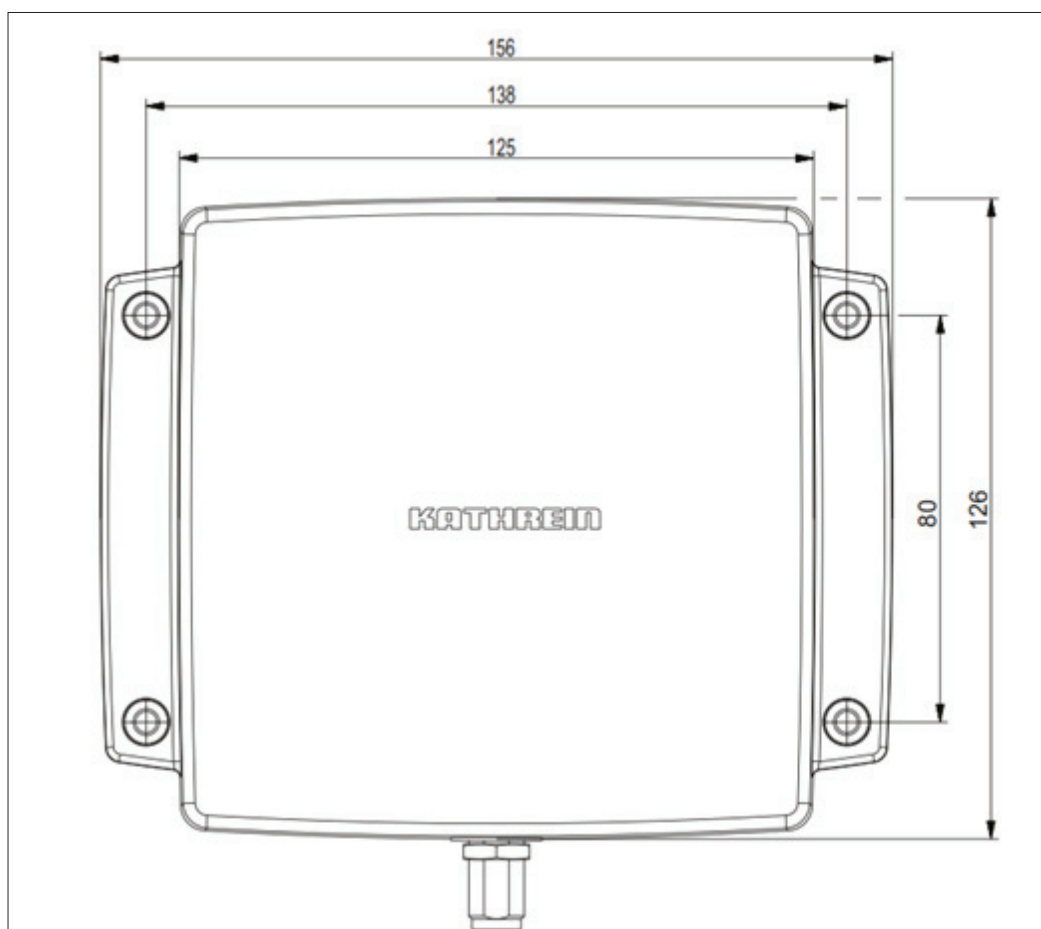


Figure 19: dimensios for MiRa/S-Mira antenna (52010172, -82, -83)

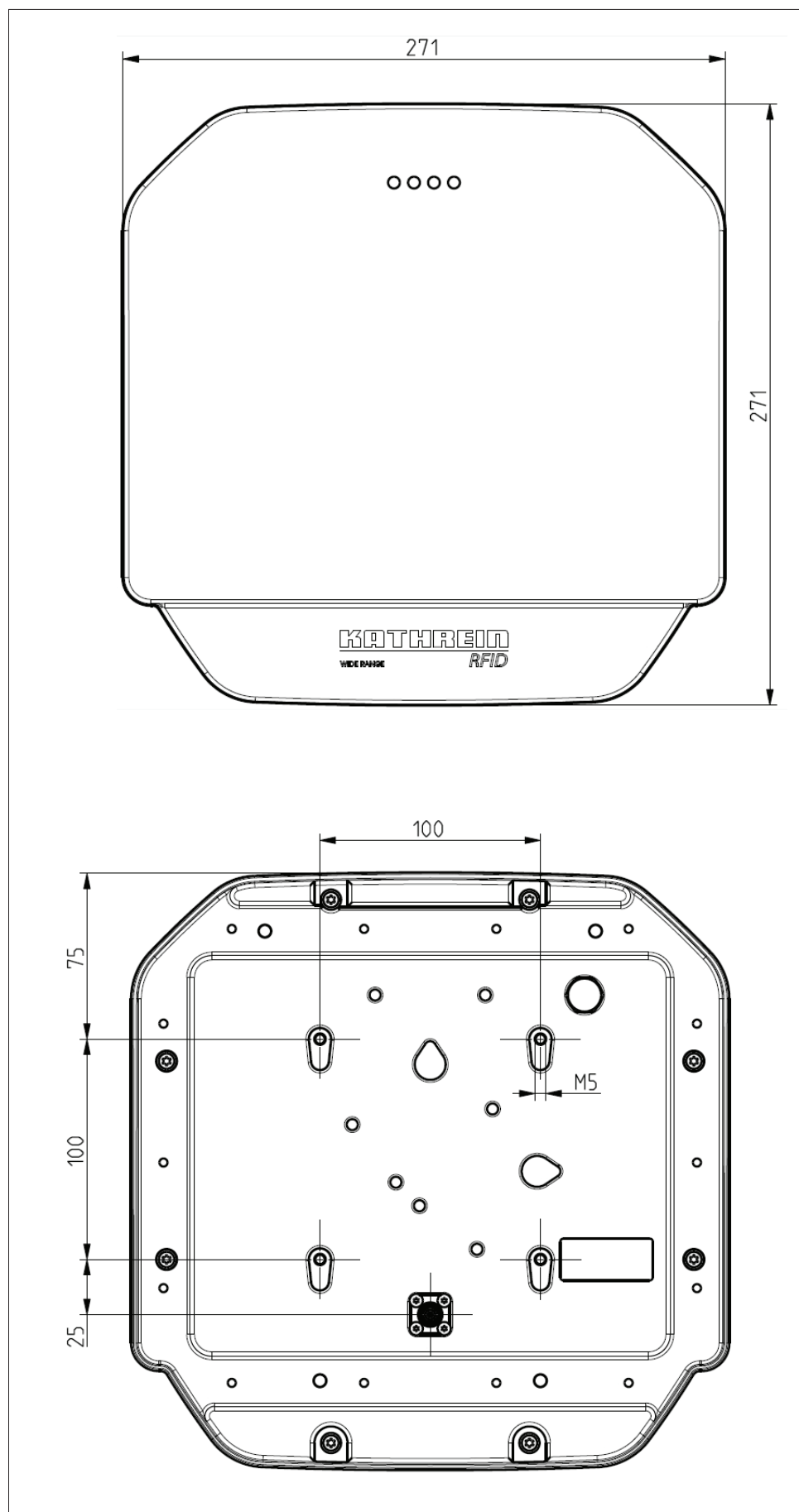


Figure 20: Dimensions for WiRa 70° antenna (52010078, -79)

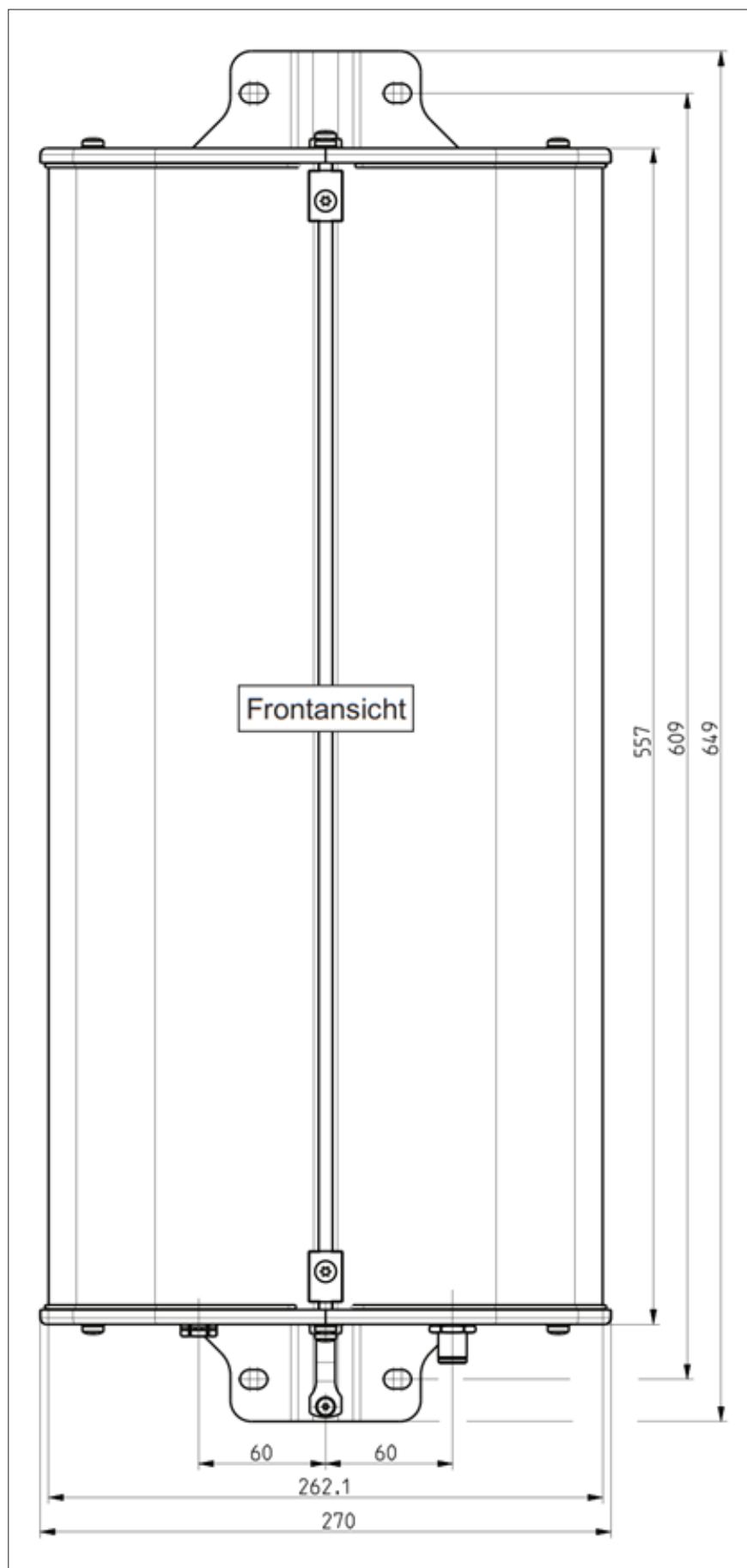


Figure 21: Dimensions for WiRa 30° antenna (52010086, -87)

The maximum output power of the reader is defined in the ETSI standard EN 302 208-2 V1.4.1 (dated July 2011) by the antenna gain, the half power beam width of the antenna and the cable attenuation on the reader-antenna connection.

Valid for WiRa 70° and WiRa 30°:

For antennas with a half power beam width of up to 90° a power of $P_{ERP,max} = 2 \text{ W ERP}$ (Effective Radiated Power) is allowed.

Valid for MiRa 100°:

For half power beam widths greater than 90° and less than 180° is a power of $P_{ERP,max} = 1,0 \text{ W ERP}$ applies.

The ERP is converted in accordance with EN 302 208-12 into output power P_C at the reader as follows:

$$P_{C,max} = P_{ERP,max} - G_{IC} + 5,15 + C_L$$

For the WiRa 70° the following maximum output power is then obtained:

$$P_{C,max} = 33 \text{ dBm} - 8,5 \text{ dBic} + 5,15 + 0 \text{ dB} = 29,65 \text{ dBm} = 0,923 \text{ W}$$

For the WiRa 30° the following maximum output power results:

$$P_{C,max} = 33 \text{ dBm} - 11,3 \text{ dBic} + 5,15 + 0 \text{ dB} = 26,85 \text{ dBm} = 0,484 \text{ W}$$

Where:

$P_{C,max}$: refers to the maximum output power of the reader in dBm,

$P_{ERP,max}$: refers to the maximum effective radiated power of the antenna in dBm,

G_{IC} : refers to the circular antenna gain in dBic,

C_L : refers to the cable loss in dB (here assumed to be 0 dB).

In LoRa and underground LoRa concept requires the input powers are limited to 0.5 and 1.0 W. More information can be found in our technical data sheets.

As RFID systems are radio installations, they fall under the European Commission directive 1999/5/EC (Radio Equipment and Telecommunications Terminal Equipment R&TTE).

A series of harmonised standards is in place to demonstrate conformity with the basic requirements of this directive, which are published in the official journal of the European Union.

The Kathrein RFID antennas is a passive antenna structure. It is therefore the system integrator who is responsible for ensuring compliance with the standards - i.e. the person who combines the individual components of an RFID system with each other, in particular the reader and antennas. We therefore strongly recommend acquiring these standards.

Two important standards in relation to antennas are (with no claim of completeness) EN 302208 and EN 50364: The first deals with frequency spectrum issues and limits the maximum radiated power, while EN 50364 addresses the limits regarding exposure of people to electromagnetic fields.

To demonstrate the conformity of the WiRa with the standard EN 50364, the specific absorption rate (SAR) is calculated numerically. The calculated SAR values are compared with the basic limit values of EN 50364 - separated according to professional exposure and exposure to the general public, as well as local exposure to head and body or the extremities. The WiRa is normally used for applications with a read range from 20 cm. At this distance the rate is significantly below the maximum SAR values allowed by law. For the case that the antenna is nevertheless to be used at shorter distances, the related SAR values are calculated numerically. The underlying assumptions (such as the operating mode of the RFID system and properties of the human tissue) guarantee a conservative estimation of the exposure (worst case scenario).

The calculations are undertaken for various constellations. The most sensitive constellation exists if the head, body or limbs of members of the general public are continuously present in the immediate vicinity of the antenna. If the distance between the person and the WIRA 70° is more than 5 cm, it is ensured the rate remains below the maximum SAR allowed with an antenna input power of up to 0.923 W (29.65 dBm). This power corresponds to the value given in the data-sheet of 2.0 W ERP. In applications with direct antenna contact (distance less than 5 cm) the input power of the WIRA 70° must be reduced to 0.697 W (28.41 dBm).

The table shows the maximum input powers with which the antenna can be supplied to ensure that the rate remains below the basic limit values for the SAR. A difference is made here between the different types of exposure.

Maximum input power U-LoRa/LoRa/S-MiRa	Distance person to U-LoRa/S-MiRa	Distance person to LoRa
Professional exposure Limit values head and body 10 W/kg Limit values local limbs 20 W/kg	Pin = 1 W (30 dBm)	Pin = 0,5 W (27 dBm)
General public Local limbs exposure Limit values local limbs 4W/kg	Pin = 1 W (30 dBm)	Pin = 0,5 W (27 dBm)
General public Head and body exposure Limit values head and body 2 W/kg	Pin = 1 W (30 dBm)	Pin = 0,1 W (20 dBm)

Figure 22: Table U-LoRa/S-MiRa/LoRa; die maximum input powers

Maximum input power MiRa ETSI	Distance person to MiRa < 1 cm	1 cm < Distance person to MiRa < 7 cm	7 cm < Distance person to MiRa
General public Limit values head and body 2 W/kg Limit values local limbs 4W/kg	Pin = 0,32 W		Pin = 1,84 W
Professional exposure Grenzwerte Kopf und Rumpf 10 W/kg	Pin = 1,75 W	Pin = 1,84 W	
Professional exposure Limit values local limbs 20 W/kg	Pin = 1,84 W		

Figure 23: Table MiRa/S-MiRa the maximum input powers

Maximum input power WiRa	Distance person to WiRa 70° < 5 cm	Distance person to WiRa 70° ≥ 5 cm
General public Limit values head and body 2 W/kg Limit values local limbs 4 W/kg	$P_{\text{ein}} = 697 \text{ mW}$ (28,41 dBm)	$P_{\text{ein}} = 923 \text{ mW}$ (29,65 dBm)
Professional exposure Limit values head and body 10 W/kg Limit values local limbs 20 W/kg	$P_{\text{ein}} = 923 \text{ mW}$ (29,65 dBm)	

Figure 24: Table WiRa; maximum input powers

Address	Contact
Kathrein RFID	E-Mail: rfd-sales@kathrein-sachsen.de
Am Kroit 25 - 27	Internet: www.kathrein-rfid.de
D-83123 Amerang	